

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-41

Name: East Oakwood Lake **County:** Brookings

Legal Description: T111N- R51W-Sec. 4-5, 8-9, 16-17

Location from nearest town: 3 miles west of Bruce, SD

Dates of present survey: July 28-30, 2008

Date last surveyed: July 31, 2006 - August 2, 2006

| Primary Game and Forage Species | Secondary and Other Species |
|---------------------------------|-----------------------------|
| Walleye | Northern Pike |
| Yellow Perch | Common Carp |
| | Bigmouth Buffalo |
| | White Sucker |
| | Black Bullhead |
| | Tadpole Madtom |
| | Green Sunfish |

PHYSICAL DATA

Surface Area: 928 acres

Maximum depth: 9 feet

Volume: 5000 acre-feet

Contour map available: Yes

OHWM elevation: 1626.9

Outlet elevation: 1626.4

Lake elevation observed during the survey: Full

Beneficial use classifications: (5) warmwater semipermanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed: 50,999 acres

Mean depth: 5 feet

Shoreline length: 10.7 miles

Date mapped: 1964

Date set: October, 1981

Date set: October, 1981

Introduction

The Oakwood Lakes complex derived its name from the numerous oak trees found in the area. East Oakwood Lake was originally named Oakwood Lake while West Oakwood was originally known as Lake Tetonkaha. East Oakwood is a natural glacial lake with an outlet that flows into the Big Sioux River.

Ownership of Lake and Adjacent Lakeshore Properties

East Oakwood Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). The north, west, and south shorelines are owned and managed by GFP while the east shoreline is privately owned.

Fishing Access

There is a single lane, concrete plank boat ramp located on the north shore of the lake. Another, barely usable, ramp exists on the south end. Shore fishing opportunities are available on the south shore and at various locations on the north and west shores.

Field Observations of Water Quality and Aquatic Vegetation

Water clarity during the survey was fairly good with a Secchi depth measurement of 61 cm (24 in). A small amount of sago pondweed (*Potamogeton pectinatus*) was observed and common cattail (*Typha spp.*) was present in the western bays.

BIOLOGICAL DATA

Methods:

East Oakwood Lake was sampled on July 28-30, 2008 with three overnight gill net sets and 10 overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Yellow perch (51.9%), walleye (28.6%), white sucker (8.8%), and northern pike (7.5%) were the most common species sampled in the gill nets (Table 1). Bigmouth buffalo and common carp were also sampled.

Table 1. Total catch from three overnight gill net sets at East Oakwood Lake, Brookings County, July 28-30, 2008.

| Species | Number | Percent | CPUE ¹ | 80% C.I. | Mean CPUE* | PSD | RSD-P | Mean Wr |
|------------------|--------|---------|-------------------|--------------|---------------|-----|-------|------------|
| Yellow Perch | 165 | 51.9 | 55.0 | <u>+10.3</u> | 50.0 | 4 | 0 | 111 |
| Walleye | 91 | 28.6 | 30.3 | <u>+1.9</u> | 56.1 | 0 | 0 | -- |
| White Sucker | 28 | 8.8 | 9.3 | <u>+4.8</u> | 1.9 | 64 | 32 | 102 |
| Northern Pike | 24 | 7.5 | 8.0 | <u>+7.1</u> | 1.0 | 36 | 0 | 92 |
| Bigmouth Buffalo | 6 | 1.9 | 2.0 | <u>+2.0</u> | 2.6 | -- | -- | -- |
| Common Carp | 4 | 1.3 | 1.3 | <u>+0.4</u> | 14.2 | -- | -- | -- |

* 4 years (2000, 2002, 2004, 2006)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullhead (92.7%), white sucker (3.1%), common carp (1.8%) and yellow perch (1.6%) were the most abundant species in the trap-net sample (Table 2). Other species sampled included northern pike bigmouth buffalo, and yellow bullhead.

Table 2. Total catch from ten overnight trap net sets at East Oakwood Lake, Brookings County, July 28-30, 2008.

| Species | Number | Percent | CPUE | 80% C.I. | Mean CPUE* | PSD | RSD-P | Mean Wr |
|-------------------------|--------|---------|-------|-------------|---------------|-----|-------|------------|
| Black Bullhead | 2,895 | 92.7 | 289.5 | +77.2 | 263.4 | 2 | 0 | 96 |
| White Sucker | 96 | 3.1 | 9.6 | +4.5 | 14.7 | 78 | 67 | 102 |
| Common Carp | 55 | 1.8 | 5.5 | +2.4 | 17.5 | 80 | 50 | 95 |
| Yellow Perch | 51 | 1.6 | 5.1 | +2.6 | 5.7 | 4 | 0 | 97 |
| Northern Pike | 12 | 0.4 | 1.2 | +0.6 | 1.0 | 78 | 22 | 93 |
| Bigmouth Buffalo | 10 | 0.3 | 1.0 | +0.4 | 2.1 | 90 | 50 | 89 |
| Yellow Bullhead | 3 | 0.1 | 0.3 | +0.3 | 0.0 | -- | -- | -- |

* 8 years (1991, 1992, 1994, 1996, 1998, 2000, 2002, 2004)

Walleye

Management objective: To maintain a walleye population with a gill-net CPUE of at least 15, 25 cm (10 in) or longer fish in three out of five lake surveys.

Walleye management in East Oakwood has been a constant battle with winterkill. Walleyes stocked following winterkills in 1997, 2001, and 2007 produced fast-growing, quality populations but few were returned to anglers before winterkill wiped them out again. Age-0 walleyes from the 2008 stocking comprised 99% of this year's sample (Table 3).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 1999-2008.

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---------|------|------|------|------|------|------|------|-------|------|------|
| CPUE | | 12.0 | | 6.3 | | 67.0 | | 139.0 | | 30.3 |
| PSD | | 88 | | 0 | | 100 | | 100 | | 0 |
| RSD-P | | 8 | | 0 | | 0 | | 12 | | 0 |
| Mean Wr | | 78 | | 99 | | 103 | | 91 | | -- |

Yellow Perch

Management objective: To maintain a yellow perch population with a gill-net CPUE of at least 25, 13 cm (5 in) or longer fish in three out of five lake surveys.

Yellow perch gill-net CPUE over the last ten years would indicate they tolerate low oxygen levels and survive winterkill better than walleyes (Table 4, Table 3). Although CPUE decreased this year (Table 4), it remains well above objective levels and the fish sampled were mainly 14-21 cm (5.5-8.3 in) yearlings (Figure 2).

Table 4. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 1999-2008.

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---------|------|------|------|------|------|------|------|------|------|------|
| CPUE | | 32.0 | | 66.0 | | 14.3 | | 87.5 | | 55.0 |
| PSD | | 81 | | 17 | | 79 | | 3 | | 4 |
| RSD-P | | 6 | | 1 | | 67 | | 0 | | 0 |
| Mean Wr | | 101 | | 108 | | 102 | | 94 | | 111 |

Black Bullhead

Management objective: To maintain a black bullhead population with a trap-net CPUE of less than 100, 15 cm (6 in) or longer fish in three out of five lake surveys.

Black bullhead trap-net CPUE has increased substantially since the 2006 survey (Table 5) and although it exceeds our management objective, the majority of the fish sampled had a mean length of 152 mm (6.0 in) (Figure 3) which indicates that recruitment of young fish is mainly responsible for the increase. Low bullhead abundance in 2004 and 2006 coincided with high walleye abundance in the same years (Table 5, Table 3).

Table 5. Black bullhead trap-net CPUE and PSD for East Oakwood Lake, Brookings County, 1999-2008.

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---------|------|-------|------|-------|------|------|------|------|------|-------|
| CPUE | | 432.7 | | 545.8 | | 7.9 | | 67.2 | | 289.5 |
| PSD | | 0 | | 5 | | 3 | | 2 | | 2 |
| RSD-P | | -- | | -- | | 3 | | 0 | | 0 |
| Mean Wr | | -- | | -- | | 82 | | 105 | | 96 |

All Species

Netting results demonstrate that the winterkill had only a minor impact on the fish community, except for walleyes which suffered nearly a complete kill (Table 6). Northern pike CPUE has increased since 2006.

Table 6. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in East Oakwood Lake, Brookings County, 1999-2008.

| Species | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| COS (GN) | -- | | | 0.3 | | -- | | -- | | -- |
| COS (TN) | -- | | | -- | | -- | | -- | | -- |
| COC (GN) | 2.3 | | | 48.0 | | 0.3 | | 6.0 | | 1.3 |
| COC (TN) | 5.7 | | | 51.4 | | 10.4 | | 2.4 | | 5.5 |
| WHS (GN) | 4.0 | | | 0.7 | | 1.3 | | 1.5 | | 9.3 |
| WHS (TN) | 4.1 | | | 22.6 | | 11.2 | | 20.9 | | 9.6 |
| BIB (GN) | 3.3 | | | 0.7 | | 6.3 | | -- | | 2.0 |
| BIB (TN) | 4.5 | | | 1.6 | | 1.9 | | 0.5 | | 1.0 |
| BLB (GN) | 141.3 | | | 21.0 | | 4.7 | | 18.0 | | -- |
| BLB (TN) | 432.7 | | | 545.8 | | 7.9 | | 67.2 | | 289.5 |
| YEB (GN) | -- | | | -- | | -- | | -- | | -- |
| YEB (TN) | -- | | | -- | | -- | | 0.1 | | 0.3 |
| TMT (GN) | -- | | | -- | | -- | | -- | | -- |
| TMT (TN) | -- | | | 7.7 | | 2.7 | | 2.5 | | -- |
| NOP (GN) | 0.7 | | | 1.0 | | 1.7 | | 0.5 | | 8.0 |
| NOP (TN) | 2.2 | | | 0.4 | | 0.3 | | 1.0 | | 1.2 |
| GSF (GN) | -- | | | -- | | -- | | -- | | -- |
| GSF (TN) | -- | | | 0.3 | | 0.3 | | 0.1 | | -- |
| OSF (GN) | -- | | | -- | | 1.3 | | 8.5 | | -- |
| OSF (TN) | -- | | | -- | | 0.3 | | 4.9 | | -- |
| YEP (GN) | 32.0 | | | 66.0 | | 14.3 | | 87.5 | | 55.0 |
| YEP (TN) | 4.1 | | | 2.1 | | 1.9 | | 14.7 | | 5.1 |
| WAE (GN) | 12.0 | | | 6.3 | | 67.0 | | 139.0 | | 30.3 |
| WAE (TN) | 3.1 | | | 0.9 | | 1.3 | | 46.7 | | -- |

COS (Common Shiner), COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), YEB (Yellow Bullhead), TMT (Tadpole Madtom), NOP (Northern Pike), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings after winterkill to reestablish the population and as needed to accomplish the management objective.
2. Stock yellow perch fry, fingerlings or adults after winterkill to reestablish the population and as needed to accomplish the management objective.
3. Accomplish the black bullhead management objective by maintaining walleye abundance and by commercial fishing when fish in the population are large enough to be marketed.
4. Monitor the East Oakwood fishery by continuing to conduct lake surveys every other year.
5. Investigate the feasibility of installing an effective carp barrier on the outlet to slow carp repopulation following winterkills.

Table 7. Stocking record for East Oakwood Lake, Brookings County, 1991-2008.

| Year | Number | Species | Size |
|-------------|---------------|----------------|-----------------|
| 1991 | 27,780 | Yellow Perch | Fingerling |
| | 7,330 | Walleye | Lrg. Fingerling |
| | 4,176 | Walleye | Sml. Fingerling |
| | 209 | Walleye | Adult |
| 1992 | 300,000 | Northern Pike | Fry |
| | 30,000 | Northern Pike | Fingerling |
| | 51,850 | Yellow Perch | Fingerling |
| 1994 | 36,610 | Yellow Perch | Lrg. Fingerling |
| | 8,620 | Yellow Perch | Adult |
| 1995 | 41,000 | Fathead Minnow | Adult |
| | 135,000 | Walleye | Sml. Fingerling |
| 1996 | 2,707,000 | Walleye | Fry |
| | 136,840 | Yellow Perch | Fingerling |
| 1997 | 1,000,000 | Walleye | Fry |
| 1999 | 1,000,000 | Walleye | Fry |
| 2001 | 100,000 | Walleye | Fingerling |
| | 10,159 | Yellow Perch | Adult |
| 2004 | 100,700 | Walleye | Fingerling |
| 2006 | 1,001,580 | Walleye | Fry |
| 2008 | 1,000,000 | Walleye | Fry |

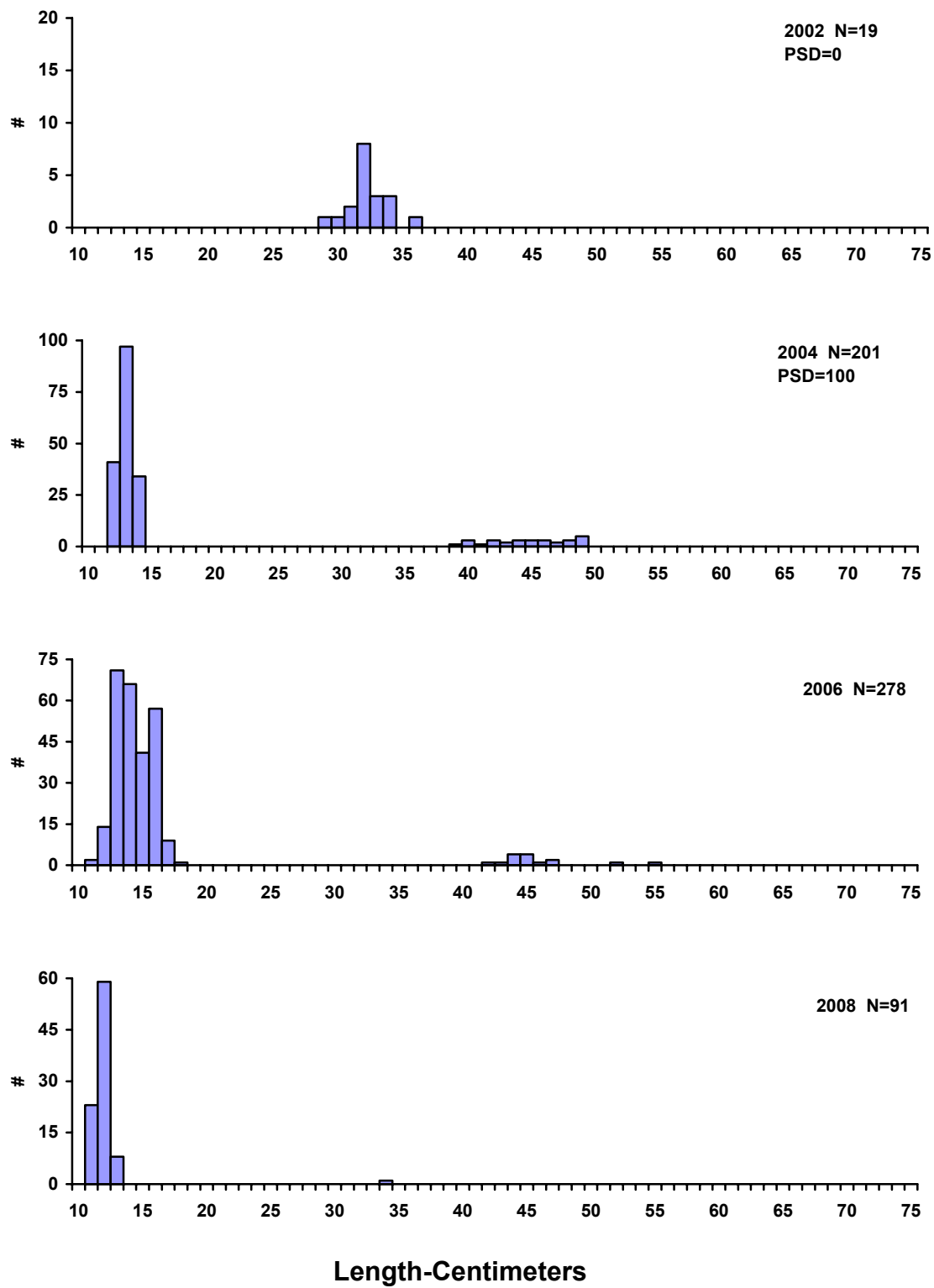


Figure 1. Length frequency histograms for walleye sampled with gill nets in East Oakwood Lake, Brookings County, 2002, 2004, 2006, and 2008.

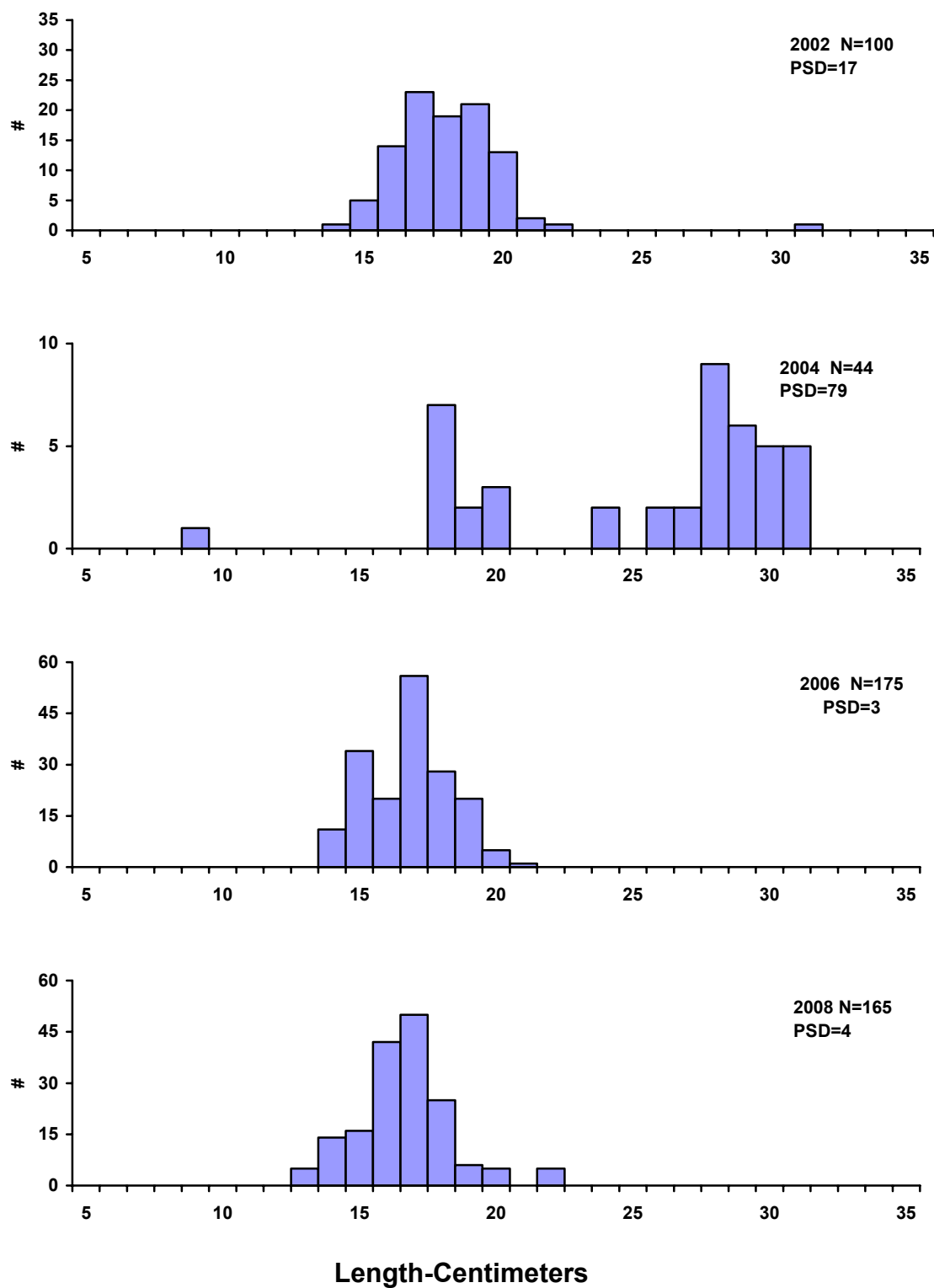


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in East Oakwood Lake, Brookings County, 2002, 2004, 2006, and 2008.

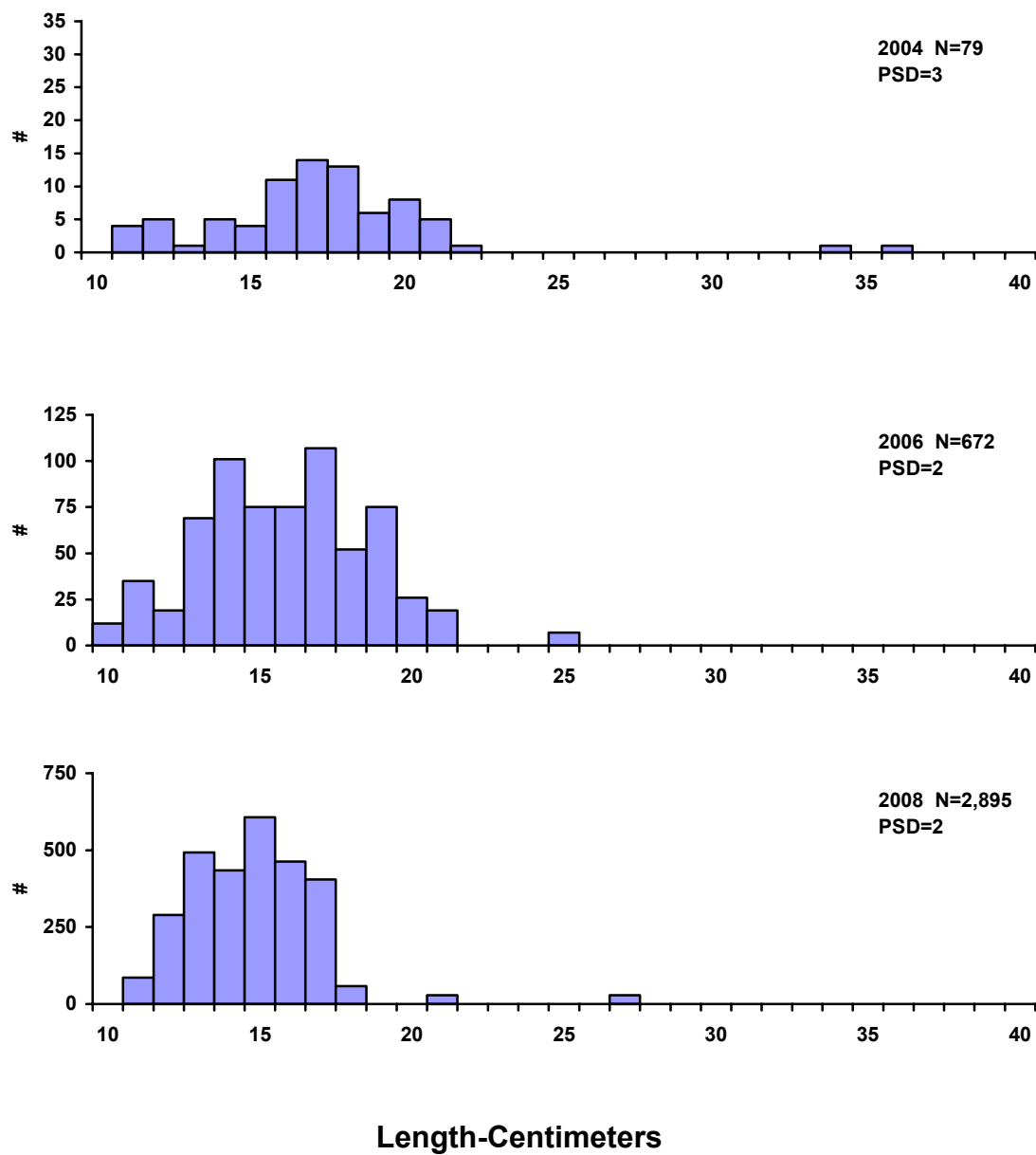


Figure 3. Length frequency histograms for black bullhead sampled with trap nets in East Oakwood Lake, Brookings County, 2004, 2006, and 2008.

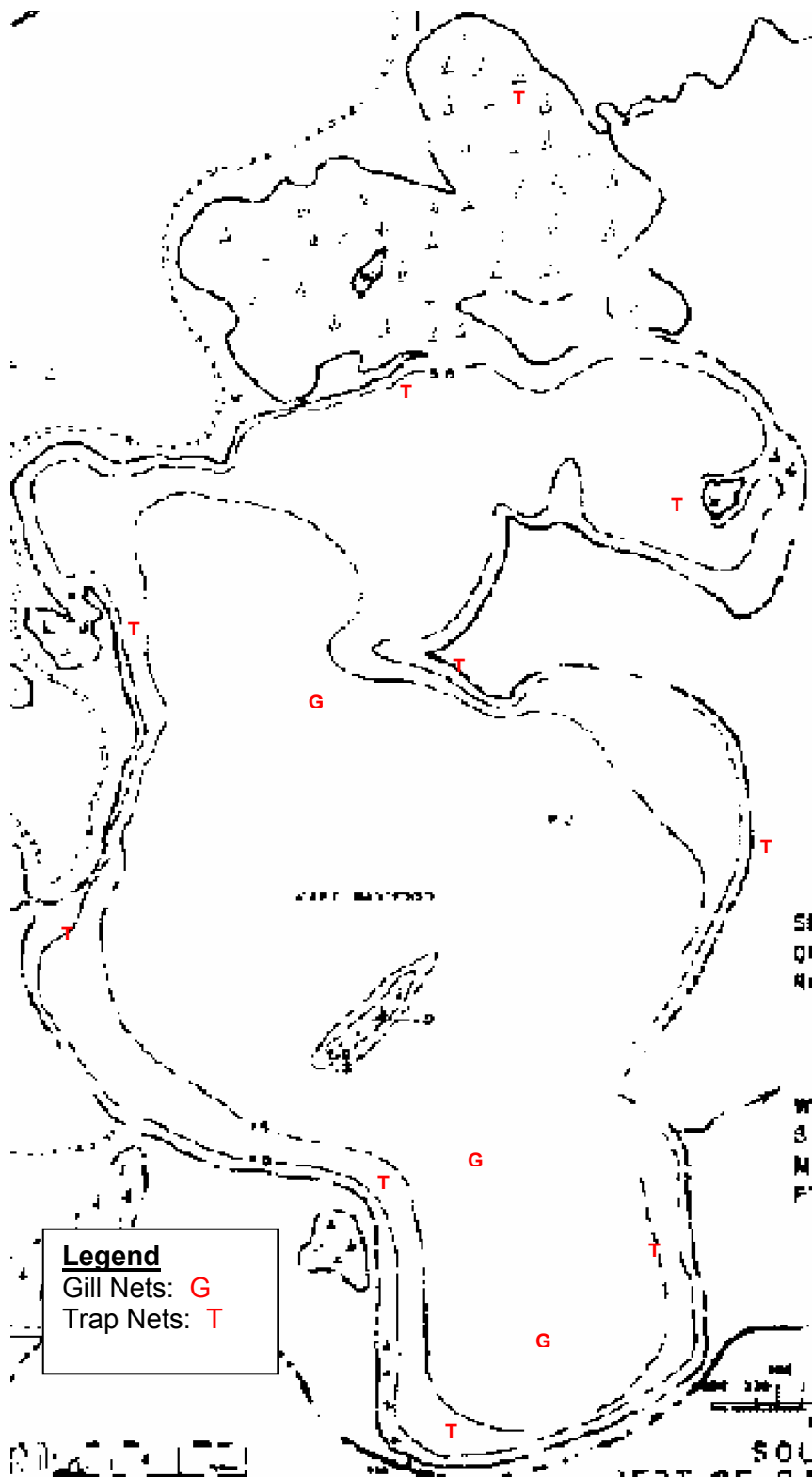


Figure 4. Sampling locations on East Oakwood, Brookings County, 2008.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

| Species | Stock | Quality | Preferred | Memorable | Trophy |
|--------------------|-------|---------|-----------|-----------|--------|
| Walleye | 25 | 38 | 51 | 63 | 76 |
| Sauger | 20 | 30 | 38 | 51 | 63 |
| Yellow perch | 13 | 20 | 25 | 30 | 38 |
| Black crappie | 13 | 20 | 25 | 30 | 38 |
| White crappie | 13 | 20 | 25 | 30 | 38 |
| Bluegill | 8 | 15 | 20 | 25 | 30 |
| Largemouth bass | 20 | 30 | 38 | 51 | 63 |
| Smallmouth bass | 18 | 28 | 35 | 43 | 51 |
| Northern pike | 35 | 53 | 71 | 86 | 112 |
| Channel catfish | 28 | 41 | 61 | 71 | 91 |
| Black bullhead | 15 | 23 | 30 | 38 | 46 |
| Common carp | 28 | 41 | 53 | 66 | 84 |
| Bigmouth buffalo | 28 | 41 | 53 | 66 | 84 |
| Smallmouth buffalo | 28 | 41 | 53 | 66 | 84 |

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.